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BULLETIN

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Andrew M. Soule, President

Extension Division

J. Phil Campbell, Director

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Winter Killing of Fruit and Nut Trees

J. W. FIROR,

Junior Professor of Horticulture.

For the last six years the author has observed considerable injury to fruit and nut trees from cold. The extent of injury has varied with seasons and has been most pronounced, year after year,

in young pecan orchards. During the past season, it was unusually large in pecan orchards; also killing many peach, apple and other trees. In some young pecan orchards, the loss was as high as 50 per cent of the trees. Observations and reports from reliable sources show that these losses were not confined to any section or any type of soil. Young pecan trees were killed at Blackshear, Thomasville, in the Albany section, Dawson and Athens, which gives a wide range of conditions and soil. At Thomasville a one-year old peach orchard was practically wiped out; the same was true at Montezuma. All of these cases were examined by the writer, while county agents have reported similar losses in all of the fruit sections of the state.

The Killing of Bearing Trees.

Observations made in bearing orchards, especially peach, have shown an unusual number of trees dying, in some cases as high as 8 per cent. Although there is little, if any, question as to the cause of the loss among young fruit and nut trees, it being generally accepted by growers and scientists as due to winter injury, there has been some question as to the cause of death among bearing peach and pecan trees. The loss of bearing peach trees has been attributed by some to the same disease that causes plum wilt; of large pecan trees, to insects. Although it is possible that plum wilt and insects have caused trees to die, it does not seem possible that these troubles should have increased the death rate over previous years. Plum wilt has been prevalent in the state for a long time. The fungus which causes it has been considered a very virulent parasite on plums, but only attacking peaches when the trees were weakened by other causes. It is probable that trees weakened by cold would be later infected by the fungus. It is also very common to find Valsa, another fungus, on trees which have been weakened by borers or other troubles.

The peach industry of the state represents a very desirable annual income and also a heavy investment. Although there does not seem to be any reason for growers to become unduly alarmed, yet the industry is of sufficient importance for this question to be worked out at once. As to whether the plum wilt or any other disease is a menace to the peach industry is a question for a plant pathologist to decide. The question of insect damage to pecan trees is for the entomologist to work out, and fortunately representatives of the government and different states in which the pecans are grown have been investigating this and will report soon, no doubt.

The question of winter killing of young pecan, peach and apples trees is a clear-cut one, as there is no doubt of the cause. The object of this circular will be to discuss this and give recommendations for preventing a repetition of the damage.

Nature of Injury.

Young trees came into foliage in the spring; later the leaves turned yellow, wilted and the tree died. In some cases the trees died a few days after starting to foliage; in others they did not succumb until August; and still others died all along between these periods. These are the other symptoms of winter injury. On making a more careful examination of these trees, the twigs and main branches were found to be green and uninjured, but the cells beneath the bark in that portion of the trunk just above the soil were found to be dead, completely girdling the trees. If the examination was made early enough in the spring, it would be found that these cells in the first few inches above the soil were discolored and dead, while the roots below and the trunk with its branches above were alive. This is the common symptom, although some trees have the entire trunk and portion of the root system killed, while others in addition to being girdled would have dead spots at the crotches.

When the cells are killed deep into the sap wood, sap usually collects in this girdled portion, turning sour and giving off a disagreeable odor. The top of the tree then dies and the roots often send up growth. When the cells are not killed to any great depth under the bark, the top of the tree continues its growth late into the summer, but sprouts are thrown up from the roots. Young trees with vigorous sprouts coming from the roots show these outward signs of winter injury.

Sun scald is also a common form of winter injury. This shows a long strip on the east and south side of the tree. It is caused by the sun warming up that side of the tree, while the other side being shaded by the tree's own trunk, is of a much lower temperature. It takes place on sunny days after cold nights. It does not kill the trees, as a rule, but weakens them and gives the borers a good place for entrance.

Twig killing differs from injury at the base in place only. It is sometimes, but not often severe enough to kill the trees. It affects bearing as well as young trees. It cuts off the year's crop when affecting bearing trees.

Suggestions for Preventing Winter Injury.

1. Give the trees a long, unbroken growing season. It is the nature of deciduous trees—trees that shed their leaves—to grow during the summer and rest, remain dormant, in winter. This is due to the season, but a tree that grows continuously and steadily in summer has a tendency to remain more thoroughly dormant in winter, while one that has rested in summer has a tendency to start growing in winter, if weather conditions are suitable.

2. Have the trees mature at frost. Maturity is one of the most important features affecting the hardiness of plants. Investigation has shown that of the parts of the trees above the soil, the cells at the base are the least mature in winter. The cells in the crotches are also poorly matured sometimes. This explains the nature of

the symptoms described above. To get trees to mature thoroughly, it is important to have them growing through the spring and summer up to the first of August or even later. From that time until frost, it is recommended that the water supply be cut off so that the trees will produce smaller and smaller cells and will be ready to stop growing when frost comes. The sowing of a crop in the orchard which will take up moisture heavily in the month of October and not so heavily in September will bring this condition about.

Wet, warm falls, following dry hot summer often brings about a bad condition. The trees grow but little in summer, when they should be growing, and then start a belated growth late in the fall. The twigs and cells of the base will be very green and unmaturred for the winter. Cultural methods planned to overcome these conditions are desired for orchards with trees younger than five years. In bearing orchards it is not so essential.

3. Mound trees with soil late in the fall. Investigations have shown that the roots of trees are less resistant to cold than the top. Of course the roots are seldom killed by cold in Georgia, as they are protected by soil. It is also known, as mentioned above, that the cells at the base are least resistant of the parts of the trees above the ground, but they are more resistant than the roots. The farther away from the base any part of the root system is located the less is its resistance to cold. If soil protects the roots from being killed, it is reasonable to suppose that if placed in a mound around the trunk of the tree it would also protect it. As near as it is possible to do so, it is suggested that this mounding be done just before frost, to a height of about one foot, having the mound wide spread, about three feet through.

4. Whitewashing the trees lessens the chances of winter injury, as it keeps the temperature of the trees' twigs, branches and trunk lower during warm days. White reflects light more than the natural color of the tree.

Formula for Whitewash.

Slake $\frac{1}{2}$ bushel of lime in boiling water, keep it covered; strain and add brine made by dissolving 1 peck of salt in warm water, and 3 pounds rice flour, then boil to a paste; add $\frac{1}{2}$ pound whitening and 1 pound of glue dissolved in warm water. Mix and let stand for a few days before using.

5. Use winter cover crops, especially on light, sandy soils, as they freeze more deeply than the heavier types.

It is not always possible to do the things necessary for preventing winter killing without seriously interfering with other operations, unless the orchardist, in planning an entire year's work, will take into consideration these things and work them into his plans. Some of the suggestions may prove too expensive, unless thought is given to carrying them out; for example, the mounding of the trees can be facilitated by plowing several furrows, so as to start the mounding and loosen the soil.



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